

**Notice of Allowability**

Application No.

10/676,467

Examiner

Victor J. Taylor

Applicant(s)

XIAO ET AL.

Art Unit

2863

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to October 01, 2003.
2. ☒ The allowed claim(s) is/are 1-35.
3. ☐ The drawings filed on \_\_\_\_\_ are accepted by the Examiner.
4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All   b) ☐ Some\*   c) ☐ None   of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
  - \* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.  
**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☒ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
  - (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date 10.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO-1449 or PTO/SB/08),  
Paper No./Mail Date 10
4. ☐ Examiner's Comment Regarding Requirement for Deposit  
of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☐ Interview Summary (PTO-413),  
Paper No./Mail Date \_\_\_\_\_.
7. ☐ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_.

## DETAILED ACTION

### *Drawings*

1. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the informal drawings with the hand drawn figures and lettering must be replaced with new formal drawings. The drawings filed on October 01, 2003 are acceptable subject to the correction of the informalities as indicated in the hand drawn figures and images that are not clear and are of poor quality as found in the informal drawings. These corrected features must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement-drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the examiner does not accept the changes, the

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applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### **Prior Art**

2. The prior art made of record and not relied upon is considered pertinent to applicant.

I. Art A of Tasci et al., US 5,563,513 in class 324/359 is cited for the method of determining formation resistivity patterns using resistivity measurements using the electromagnetic imaging device in figure 1 and delineating anomalous resistivity patterns associated with oil and gas traps. He further teaches a method of mapping anomalous resistivity patterns associated with hydrocarbon accumulations in lines 1-5 of column 2. He further discloses the apparatus 10 with means for transmission along the horizontal axis X with receiver means 26 with equation processed using the computer in lines 1-64 of column 5 and 6 with means to move and detect vertical magnetic data and in time the detects the changes at depth in line 15 of column 6 and discloses the tri directional X, Y, Z orientation of the various depth points of space 54 in the volume 10 in figure 2. He further teaches a technique using the Archie's Law in line 40 of column 4 with the computation processes 28 in the computer in line 5 of column 6.

II. Art B of Dasgupta et al., US 6,868,037 in class 367/054 is cited for the method of Tomography modeling the near surface layers of the 3-component seismic data S1 in figure 6 and further teaches the X space and Y space at the plurality of Z depth space in figure 9. He further teaches detailed modeling of the near surfaces of 3D surface seismic data in lines 30-35 of column 2. He further teaches using SWD data that

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corresponds to depth point space in line 30 and teaches means of using the tomography inversion algorithm and the equation 3 in lines 30-65 to process the data in column 7. He further teaches the slowness vector in the velocity field in line 55 and further discloses the borehole with the cross correlation computation means 100 in figure 1.

***Allowable Subject Matter***

3. Claims 1-33 are allowed.
4. The following is an examiner's statement of reasons for allowance:

The method and apparatus for inversion processing of wellbore logging data in a selected pattern space by constructing a data model defined by a plurality of measured conductivity parameters with steps for determining the values for a first subset and a second subset of a plurality of parameters into the selected pattern space and providing for the construction the data model using the claimed combination of limitation sets is not found in the cited art of record.

I. The method in claim 1 for constructing a data model defined by a plurality of parameters with computer computations for forming the inversion model with method step limitations for "collecting a plurality of field measurements with each of the plurality of field measurements bearing an indirect relationship to a first subset of the plurality of parameters" ...[and] with steps for "transforming the collected plurality of field measurements into a selected pattern space" ...[and/or] in combination with the particularly claimed steps wherein "the determining values for the first subset of the plurality of parameters from the collected plurality of field measurements after the

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transformations of the collected plurality of the field measurements into the selected pattern space"...[and] in combination with the step for "constructing the data model using the determined values for the first subset of parameters" to construct the inversion model to produce the determination of the formation parameters and determine the hydrocarbon saturation is not found in the cited art of record.

The prior Art A of Tasci teaches the method of determining the formation resistivity patterns by using resistivity measurements and using the electromagnetic imaging device in figure 1 and computational processes for delineating the anomalous resistivity patterns that are associated with the oil and the gas traps. He further teaches a method for mapping the anomalous resistivity patterns that are associated with the hydrocarbon accumulations see lines 1-5 of column 2. He further teaches the apparatus 10 and the means for transmission of signals along the horizontal axis X. He further teaches the receiver means 26. He teaches computational computer processes using the equation and teaches the processed data by using the computer in lines 1-64 of column 5 and 6. He teaches the means to move and detect the vertical magnetic data and in time he detects the changes at depth see line 15 of column 6. He further discloses the tri directional and the X, Y, Z orientation of the various depth points of space 54 in the volumn10 in figure 2. He further teaches a technique using the Archie's Law in line 40 of column 4 with the computation processes 28 in the computer in line 5 of column 6.

The prior Art B of Dasgupta teaches the method for Tomography modeling of the near surface layers of the 3-component seismic data S1 in figure 6. He further teaches

the X space and the Y space at the plurality of the Z depth space in figure 9. He further teaches the detailed modeling of the near geophysical surfaces of the 3D surface seismic data in lines 30-35 of column 2. He further teaches using the SWD data obtained from the borehole corresponding to the depth point space in line 30. He further teaches the means for using the topographic inversion algorithm and discloses the use of equation 3 in lines 30-65 to process the data in column 7. He further teaches the slowness vector in the velocity field in line 55 and further discloses the borehole with the cross correlation computation means 100 in figure 1.

Therefore, the prior art Tasci et al., and The prior art of Dasgupta et al., in combination or alone does not teach the present limitation of the claimed combination limitation.

It is these limitations expressed in each of these claims and not found, taught, or suggested in the prior art of record, that makes these claims allowable over the prior art.

Claims 2-11 are dependent on the allowed independent claim 1 and are allowed at least for the reasons cited above.

II. The method in claim 12 for constructing a data model defined by a plurality of parameters with method step limitations for “collecting a plurality of field measurements with each of the plurality of field measurements bearing an indirect relationship to a first subset of the plurality of parameters and a direct relationship to a second subset of the plurality of parameters”...[and] with steps for “estimating the values for the second subset of parameters from the collected plurality of field measurements”...[and] with the particularly claimed steps for “transforming the collected plurality of field measurements

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into a selected pattern space"...[and/or] in combination with the particularly claimed steps wherein "the determining values for the first subset of the plurality of parameters from the collected plurality of field measurements after the transformations of the collected plurality of the field measurements into the selected pattern space"...[and] with the step for "determining in a measured space the values for the second subset of the plurality of parameters from the collected plurality of field measurements and the determined values for the first subset of parameters..."[and] in combination with the step for "constructing the data model using the determined values for the first subset of parameters and the determined values of the second subset of the plurality of parameters" to construct the inversion model to produce the determination of the formation parameters and determine is not found in the cited art of record.

The prior Art A of Tasci teaches the method of determining the formation resistivity patterns by using resistivity measurements and using the electromagnetic imaging device in figure 1 and computational processes for delineating the anomalous resistivity patterns that are associated with the oil and the gas traps. He further teaches a method for mapping the anomalous resistivity patterns that are associated with the hydrocarbon accumulations see lines 1-5 of column 2. He further teaches the apparatus 10 and the means for transmission of signals along the horizontal axis X. He further teaches the receiver means 26. He teaches computational computer processes using the equation and teaches the processed data by using the computer in lines 1-64 of column 5 and 6. He teaches the means to move and detect the vertical magnetic data and in time he detects the changes at depth see line 15 of column 6. He further

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discloses the tri directional and the X, Y, Z orientation of the various depth points of space 54 in the volumn10 in figure 2. He further teaches a technique using the Archie's Law in line 40 of column 4 with the computation processes 28 in the computer in line 5 of column 6.

The prior Art B of Dasgupta teaches the method for Tomography modeling of the near surface layers of the 3-component seismic data S1 in figure 6. He further teaches the X space and the Y space at the plurality of the Z depth space in figure 9. He further teaches the detailed modeling of the near geophysical surfaces of the 3D surface seismic data in lines 30-35 of column 2. He further teaches using the SWD data obtained from the borehole corresponding to the depth point space in line 30. He further teaches the means for using the topographic inversion algorithm and discloses the use of equation 3 in lines 30-65 to process the data in column 7. He further teaches the slowness vector in the velocity field in line 55 and further discloses the borehole with the cross correlation computation means 100 in figure 1.

Therefore, the prior art Tasci et al., and The prior art of Dasgupta et al., in combination or alone does not teach the present limitation of the claimed combination limitation.

It is these limitations expressed in each of these claims and not found, taught, or suggested in the prior art of record, that makes these claims allowable over the prior art.

Claims 13-26 are dependent on the allowed independent claim 12 and are allowed at least for the reasons cited above.



III. The apparatus in claim 27 for determining at least one characteristic of a subsurface formation comprising the apparatus of “a logging tool having a transmitter and at least one receiver array for acquiring the geophysical measurements related to the subsurface geophysical formation”...[and] with the “computing device coupled to the logging tool with the computing device programmed to execute software to “transform the acquired geophysical measurements into a selected pattern space””...[and] with the program steps to “calculate in pattern space a subset of indirect parameters for the subsurface formation from the transformed geophysical measurements” to construct the inversion model to produce the determination of the formation parameters and determine is not found in the cited art of record.

The prior Art A of Tasci teaches the method of determining the formation resistivity patterns by using resistivity measurements and using the electromagnetic imaging device in figure 1 and computational processes for delineating the anomalous resistivity patterns that are associated with the oil and the gas traps. He further teaches a method for mapping the anomalous resistivity patterns that are associated with the hydrocarbon accumulations see lines 1-5 of column 2. He further teaches the apparatus 10 and the means for transmission of signals along the horizontal axis X. He further teaches the receiver means 26. He teaches computational computer processes using the equation and teaches the processed data by using the computer in lines 1-64 of column 5 and 6. He teaches the means to move and detect the vertical magnetic data and in time he detects the changes at depth see line 15 of column 6. He further discloses the tri directional and the X, Y, Z orientation of the various depth points of

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space 54 in the column 10 in figure 2. He further teaches a technique using the Archie's Law in line 40 of column 4 with the computation processes 28 in the computer in line 5 of column 6.

The prior Art B of Dasgupta teaches the method for Tomography modeling of the near surface layers of the 3-component seismic data S1 in figure 6. He further teaches the X space and the Y space at the plurality of the Z depth space in figure 9. He further teaches the detailed modeling of the near geophysical surfaces of the 3D surface seismic data in lines 30-35 of column 2. He further teaches using the SWD data obtained from the borehole corresponding to the depth point space in line 30. He further teaches the means for using the topographic inversion algorithm and discloses the use of equation 3 in lines 30-65 to process the data in column 7. He further teaches the slowness vector in the velocity field in line 55 and further discloses the borehole with the cross correlation computation means 100 in figure 1.

Therefore, the prior art Tasci et al., and The prior art of Dasgupta et al., in combination or alone does not teach the present limitation of the claimed combination limitation.

It is these limitations expressed in each of these claims and not found, taught, or suggested in the prior art of record, that makes these claims allowable over the prior art.

Claims 28-35 are dependent on the allowed independent claim 27 and are allowed at least for the reasons cited above.

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***Conclusion***


5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Victor J. Taylor whose telephone number is 517-272-2281. The examiner can normally be reached on 8:00 to 5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John E. Barlow can be reached on 571-272-2863. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

VJT

May 12, 2005

  
MICHAEL NGHIEM  
PRIMARY EXAMINER